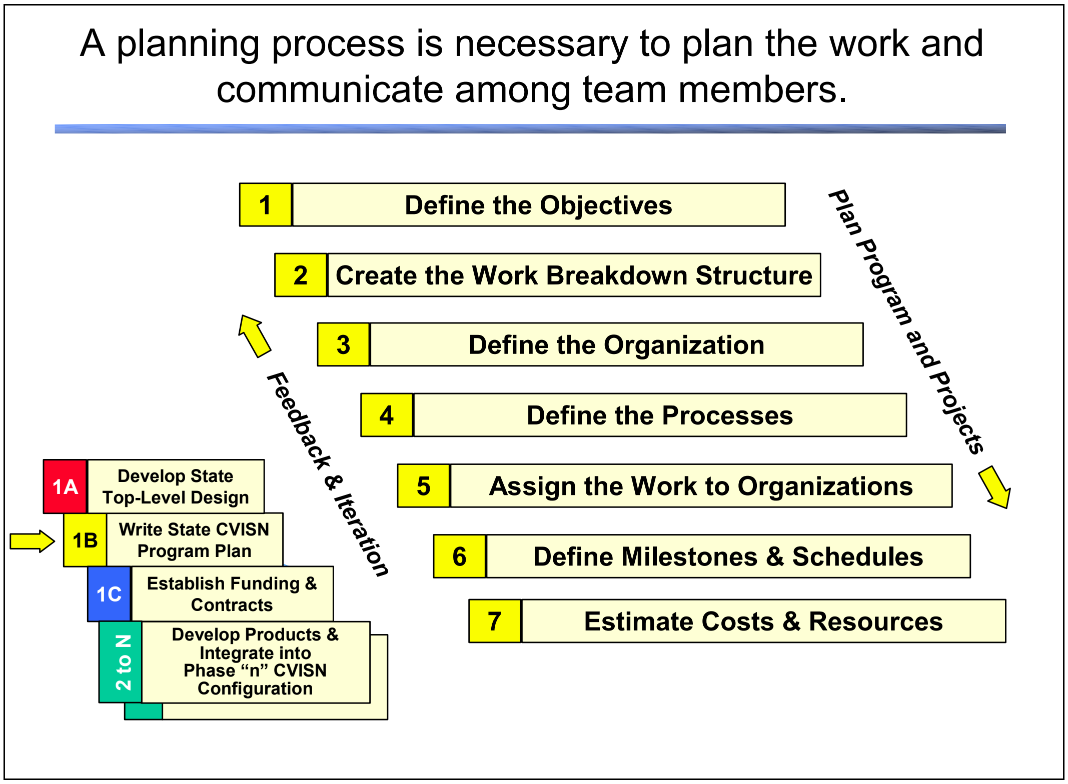
5. CVISN State Program and Project Planning Process Steps

"Planning seems intuitively obvious. Why do we need to articulate a process for it?"

5.1 Why Do We Need a Planning Process?

A rigorous planning process is necessary to efficiently and effectively discover and formalize the work to be done; and then to communicate that among team members and other stakeholders. Such a planning process:

- Portrays the scope via the Work Breakdown Structure (WBS).
- Identifies key milestone events.
- Defines all tasks and responsibilities.
- Identifies interfaces.
- Provides master budgets.
- Provides many effective communication devices.
- Should involve those who will carry out the plan.


A planning process is necessary to plan the work and communicate among team members.

1
Define the Objectives
2
Create the Work Breakdown Structure
3
Define the Organization
4
Define the Processes
5
Assign the Work to Organizations
6
Define Milestones & Schedules
7
Estimate Costs & Resources
Plan Program and Projects
Feedback & Iteration
1A
Develop State Top-Level Design
1B
Write State CVISN Program Plan
1C
Establish Funding & Contracts
2 to N
Develop Products & Integrate into Phase "n" CVISN Configuration

Figure 5-1. Planning Process Steps

The steps in the planning process are portrayed in Figure 5–1 sequentially, but in practice iteration of the steps is necessary in order to converge on an acceptable final plan. During this iteration period a continuous review by the Program Manager, the System Architect, and the leads of all participating agencies culminates with approval and sign-off.

The planning process described in this chapter applies to both the overall CVISN program and to its subordinate projects. In general, you should plan what you can at the program-level first, and then do project-level planning to flesh out the details. **Based on the experiences of the CVISN prototype and pilot states, it works best to develop a program plan that is supported by a coordinated set of project plans.** Let the program plan steer the project planning, and then feed back the results of project planning to the program plan. Chapter 1 of this document summarized the purposes for those two levels of plans.

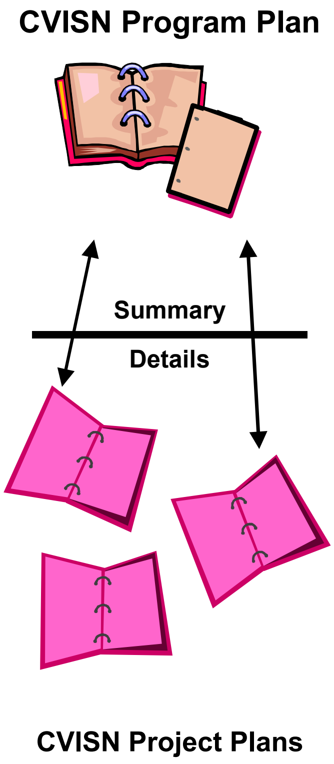
This chapter describes the program and project planning processes. The results of these planning activities should be captured in a written plan. Something magic happens when responsible people actually have to sign off on it.

The planning process is most effective when the key players on the project team are closely involved. That means that the Program Manager should involve the Project Leaders, System Architect, facilitator/administrator, and other key members of the team. But don’t forget to stay in touch with the oversight bodies that have been established, so that the plans don’t stray too far from the common understanding of what you are doing in the state.

Visualize assembling several notebooks – one for the program, and one for each project. Some pages are duplicated in both the program plan and the project plans. Some pages in the program plan summarize what all the project plans say.

Figure 5–2 depicts the recommended chapters in a plan document. Whereas both plans contain the same chapter names, the Program Plan contains summary information and the Project Plans contain details. Appendix B of this Guide is an annotated outline for a Program Plan. Appendix C is an annotated outline for a Project Plan.

In the sections that follow there is guidance for program planning, project planning, and how the two activities inter-relate. When there is no specific qualifier, the advice applies equally to both program and project planning.



Topic	Program Plan	Project Plan(s)
Executive Summary	▤	Highlights
Introduction	▤	▤
Objectives	▤ (& Projects)	▤
Requirements & Design (mostly by reference to System Design Description)	▤	▤
Work Breakdown Structure	▤	▤
Organization Structure	▤ (Agency and Program Charts)	▤ (Project Charts)
Work Assignments (based on WBS)	▤	▤
Procurement Strategy	▤	
Processes	▤	Deltas from Program Standards
Schedule & Milestone Information	Phases & Critical Milestones	Detailed Schedule & Milestones
Financial Information	Known Funding Sources, Program Budget	Project Budget Details
Products	▤	▤
Issues	▤	▤

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Figure 5-2. The Program and Project Plans

5.2 Define the Objectives (Step 1)

The ITS/CVO Strategic Business Plan for your state should be the starting point for your CVISN **program** planning process. The Strategic Business Plan establishes a 5-year perspective for ITS/CVO objectives. (You started with those objectives and refined them at the CVISN Scope Workshop.) The objectives are the starting point for your top-level design. You ought to be able to fit the objectives on a single page. They specify the expected results of implementing the projects that will be spun out of the program. Listing the objectives should be the first step in identifying the projects that make up the CVISN program in the state.

Next, as **projects** are identified you set out specific objectives for each one. The project objectives should support the top-level objectives for the overall program.

State the objectives in terms that everyone can understand – from the user's point of view, not from the developer's point of view! Often the list of objectives will be used to justify funding. Everyone wants to know "what's in it for me?"

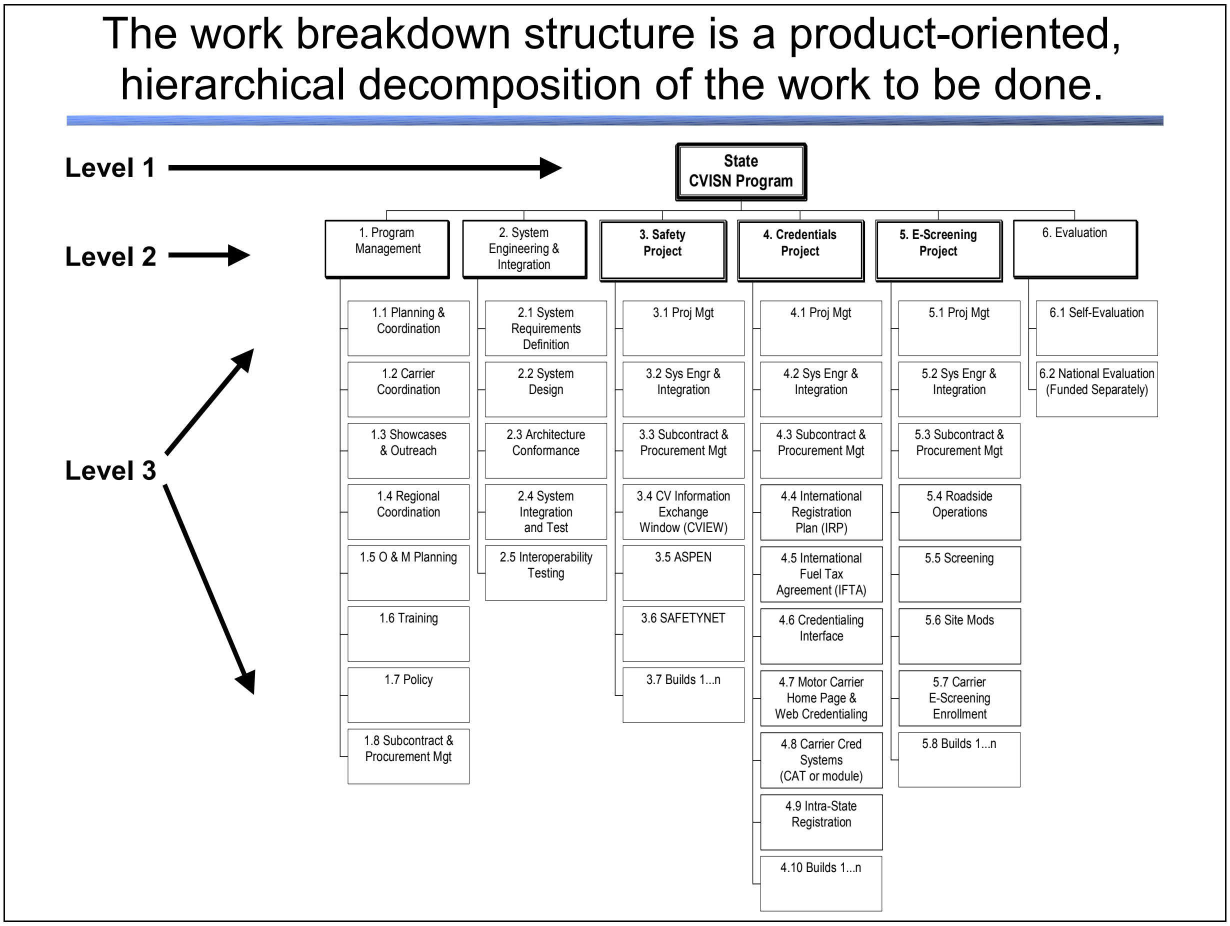
5.3 Create the Work Breakdown Structure (Step 2)

5.3.1 Product-Oriented Hierarchical Decomposition

The WBS is a way of organizing and portraying the tasks to be done in a **product-oriented hierarchical decomposition** such that the full scope and limits of the program and its subsidiary projects can readily be seen at every level. The WBS is displayed graphically as an inverted tree with the root at the top, or written as an indented list. All envisioned efforts should have a home somewhere in the WBS.

The WBS is the common framework for planning and control. For example, numeric codes assigned to WBS elements are written onto time cards and purchase requisitions.

Figure 5–3 presents a sample state CVISN Work Breakdown Structure in the form of an inverted tree. Personal computer “organization structure” software packages can produce this diagram automatically.



The work breakdown structure is a product-oriented, hierarchical decomposition of the work to be done.

Level 1
Level 2
Level 3
State CVISN Program
1. Program Management
2. System Engineering & Integration
3. Safety Project
4. Credentials Project
5. E-Screening Project
6. Evaluation
1.1 Planning & Coordination
1.2 Carrier Coordination
1.3 Showcases & Outreach
1.4 Regional Coordination
1.5 O & M Planning
1.6 Training
1.7 Policy
1.8 Subcontract & Procurement Mgt
2.1 System Requirements Definition
2.2 System Design
2.3 Architecture Conformance
2.4 System Integration and Test
2.5 Interoperability Testing
3.1 Proj Mgt
3.2 Sys Engr & Integration
3.3 Subcontract & Procurement Mgt
3.4 CV Information Exchange Window (CVIEW)
3.5 ASPEN
3.6 SAFETYNET
3.7 Builds 1...n
4.1 Proj Mgt
4.2 Sys Engr & Integration
4.3 Subcontract & Procurement Mgt
4.4 International Registration Plan (IRP)
4.5 International Fuel Tax Agreement (IFTA)
4.6 Credentialing Interface
4.7 Motor Carrier Home Page & Web Credentialing
4.8 Carrier Cred Systems (CAT or module)
4.9 Intra-State Registration
4.10 Builds 1...n
5.1 Proj Mgt
5.2 Sys Engr & Integration
5.3 Subcontract & Procurement Mgt
5.4 Roadside Operations
5.5 Screening
5.6 Site Mods
5.7 Carrier E-Screening Enrollment
5.8 Builds 1...n
6.1 Self-Evaluation
6.2 National Evaluation (Funded Separately)

Figure 5-3. Sample CVISN WBS in Tree Format to Level 3

The 3 core deployment projects appear at the second level of this WBS, where they have been emphasized with highlighted boxes. In the discipline of major national defense project planning – where the WBS had its origin – these core projects would be called the "prime mission equipment". The WBS must be taken to further levels of detail as part of the project planning process. The Program Manager creates the top-levels of the WBS and then delegates the creation and maintenance of the lower levels to the various projects.

Note that there is a special requirement for assessment and evaluation of federally-funded ITS projects [76], hence its inclusion as a separate top-level WBS element.

Subsequent levels of detail are usually shown on separate diagrams. Deliverable products and services need to be itemized, including hardware/software systems, documentation, training, user support, and maintenance/upgrade services. Note that support functions such as project management and system engineering are explicitly included.

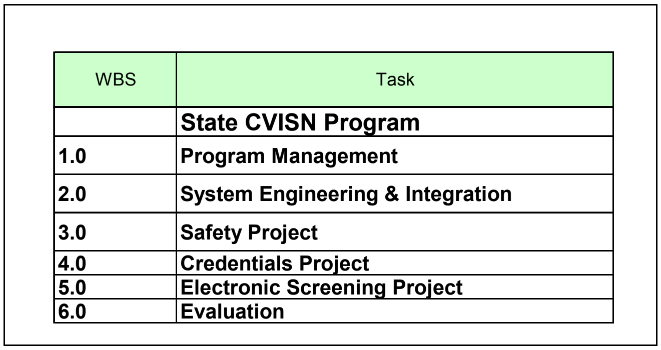
The WBS is intended to be a working tool. As such, it becomes the basis for:

- Cost estimates and budgets.
- Milestones and schedules.
- Responsibility assignment.
- Allocation of resources.
- Schedule vertical (milestone) and horizontal (dependency) traceability.
- Risk assessment and mitigation.
- Concurrence of participants.
- Integrating the total project effort.
- Summarizing costs, schedules, and tracking status.
- Forcing the manager to think through all elements of the project.

The WBS sets the stage for all other aspects of project planning.

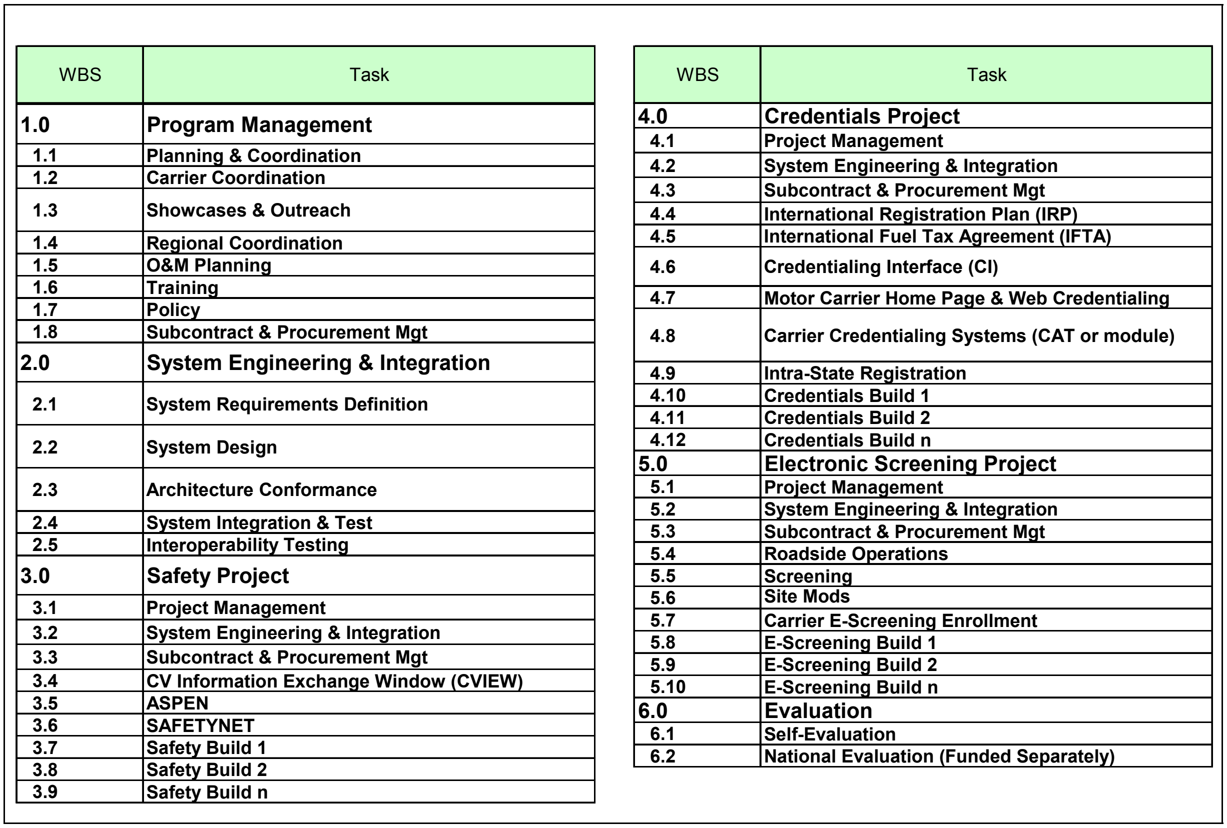
5.3.2 Indented List Adds Detail

To include information attributes on the WBS, or to extend it below level 3, requires portraying it in indented list format. Common desktop “spreadsheet” software packages, and “project management” packages, can produce this indented list; they have the additional advantage of automatic rollup to different levels as shown in Figures 5–4 through 5–7.



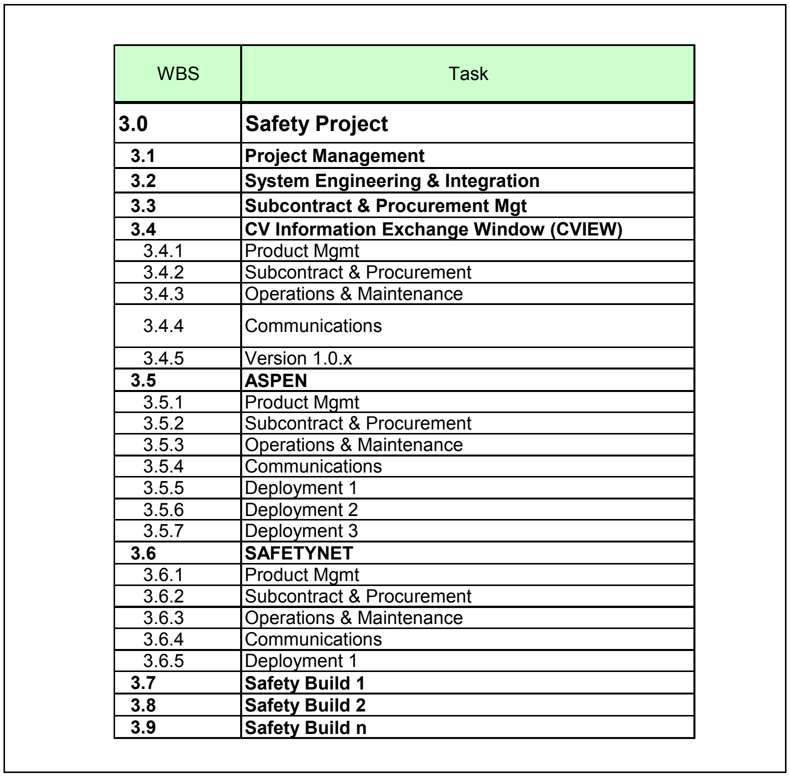
WBS	Task
	State CVISN Program
1.0	**Program Management**
2.0	**System Engineering & Integration**
3.0	**Safety Project**
4.0	**Credentials Project**
5.0	**Electronic Screening Project**
6.0	**Evaluation**

Figure 5-4. Sample CVISN WBS in List Format to Level 2



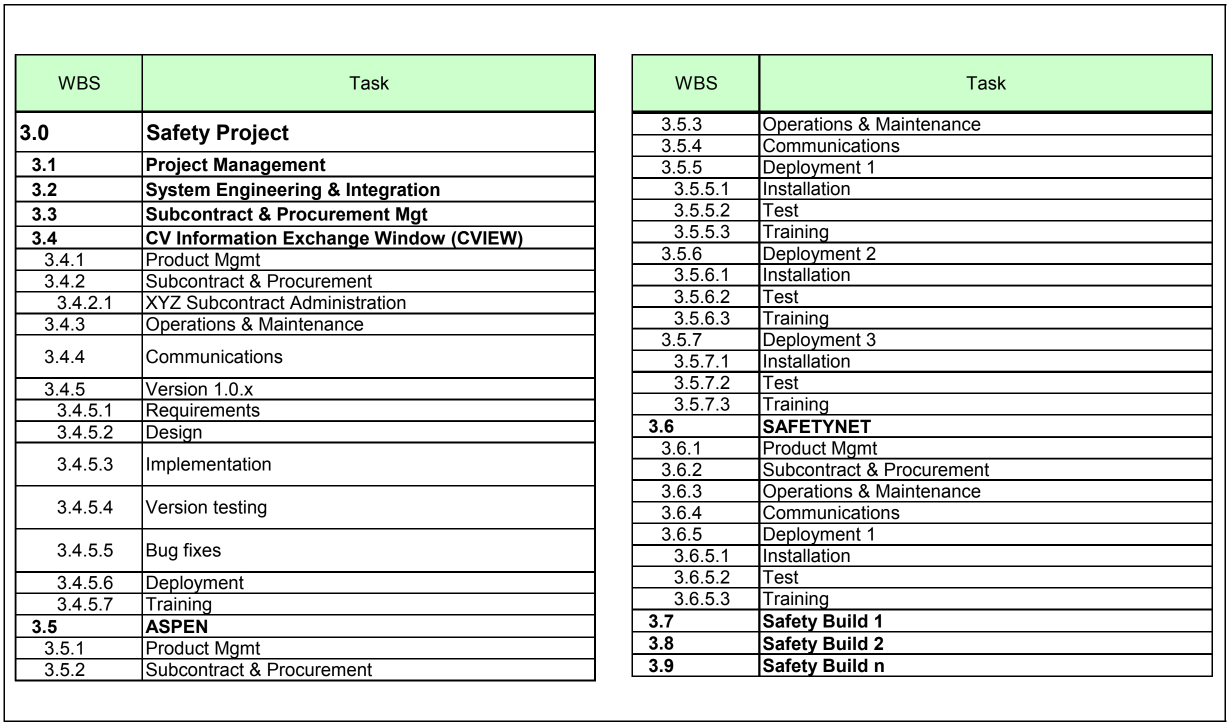
WBS	Task
1.0	**Program Management**
1.1	Planning & Coordination
1.2	Carrier Coordination
1.3	Showcases & Outreach
1.4	Regional Coordination
1.5	O&M Planning
1.6	Training
1.7	Policy
1.8	Subcontract & Procurement Mgt
2.0	**System Engineering & Integration**
2.1	System Requirements Definition
2.2	System Design
2.3	Architecture Conformance
2.4	System Integration & Test
2.5	Interoperability Testing
3.0	**Safety Project**
3.1	Project Management
3.2	System Engineering & Integration
3.3	Subcontract & Procurement Mgt
3.4	CV Information Exchange Window (CVIEW)
3.5	ASPEN
3.6	SAFETYNET
3.7	Safety Build 1
3.8	Safety Build 2
3.9	Safety Build n
4.0	**Credentials Project**
4.1	Project Management
4.2	System Engineering & Integration
4.3	Subcontract & Procurement Mgt
4.4	International Registration Plan (IRP)
4.5	International Fuel Tax Agreement (IFTA)
4.6	Credentialing Interface (CI)
4.7	Motor Carrier Home Page & Web Credentialing
4.8	Carrier Credentialing Systems (CAT or module)
4.9	Intra-State Registration
4.10	Credentials Build 1
4.11	Credentials Build 2
4.12	Credentials Build n
5.0	**Electronic Screening Project**
5.1	Project Management
5.2	System Engineering & Integration
5.3	Subcontract & Procurement Mgt
5.4	Roadside Operations
5.5	Screening
5.6	Site Mods
5.7	Carrier E-Screening Enrollment
5.8	E-Screening Build 1
5.9	E-Screening Build 2
5.10	E-Screening Build n
6.0	**Evaluation**
6.1	Self-Evaluation
6.2	National Evaluation (Funded Separately)

Figure 5-5. Sample CVISN WBS in List Format to Level 3



WBS	Task
3.0	**Safety Project**
3.1	**Project Management**
3.2	**System Engineering & Integration**
3.3	**Subcontract & Procurement Mgt**
3.4	**CV Information Exchange Window (CVIEW)**
3.4.1	Product Mgmt
3.4.2	Subcontract & Procurement
3.4.3	Operations & Maintenance
3.4.4	Communications
3.4.5	Version 1.0.x
3.5	**ASPEN**
3.5.1	Product Mgmt
3.5.2	Subcontract & Procurement
3.5.3	Operations & Maintenance
3.5.4	Communications
3.5.5	Deployment 1
3.5.6	Deployment 2
3.5.7	Deployment 3
3.6	**SAFETYNET**
3.6.1	Product Mgmt
3.6.2	Subcontract & Procurement
3.6.3	Operations & Maintenance
3.6.4	Communications
3.6.5	Deployment 1
3.7	**Safety Build 1**
3.8	**Safety Build 2**
3.9	**Safety Build n**

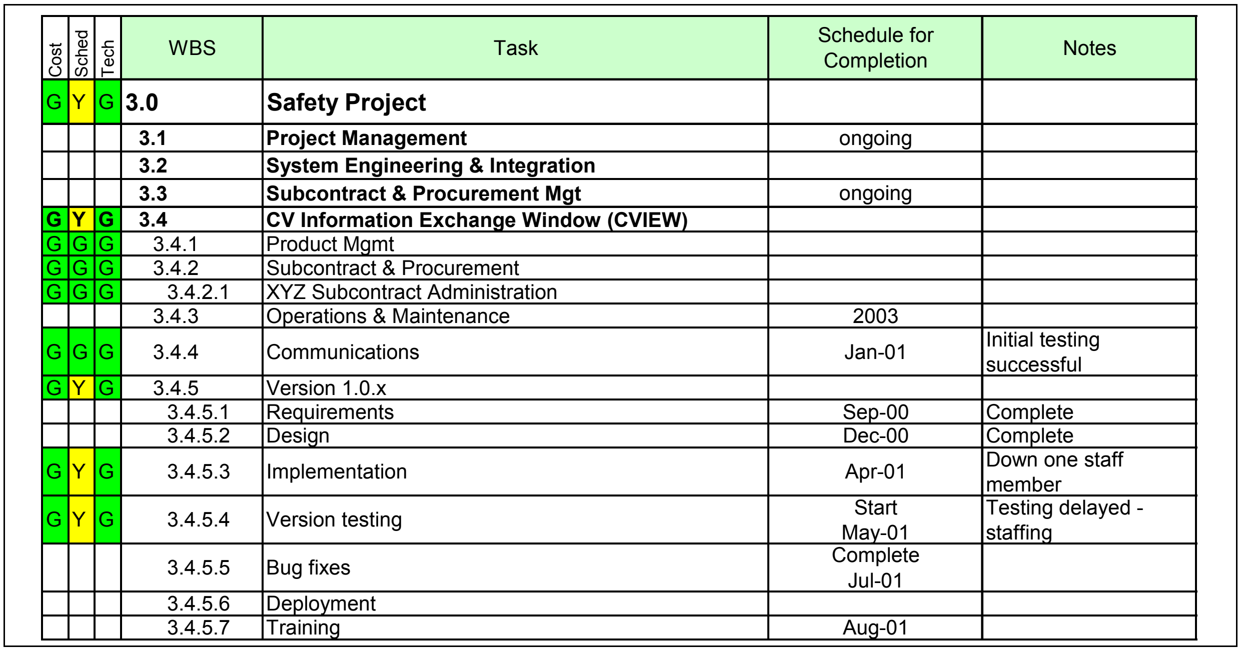
Figure 5-6. Portion of Sample CVISN WBS in List Format to Level 4



WBS	Task
3.0	**Safety Project**
3.1	**Project Management**
3.2	**System Engineering & Integration**
3.3	**Subcontract & Procurement Mgt**
3.4	**CV Information Exchange Window (CVIEW)**
3.4.1	Product Mgmt
3.4.2	Subcontract & Procurement
3.4.2.1	XYZ Subcontract Administration
3.4.3	Operations & Maintenance
3.4.4	Communications
3.4.5	Version 1.0.x
3.4.5.1	Requirements
3.4.5.2	Design
3.4.5.3	Implementation
3.4.5.4	Version testing
3.4.5.5	Bug fixes
3.4.5.6	Deployment
3.4.5.7	Training
3.5	**ASPEN**
3.5.1	Product Mgmt
3.5.2	Subcontract & Procurement
3.5.3	Operations & Maintenance
3.5.4	Communications
3.5.5	Deployment 1
3.5.5.1	Installation
3.5.5.2	Test
3.5.5.3	Training
3.5.6	Deployment 2
3.5.6.1	Installation
3.5.6.2	Test
3.5.6.3	Training
3.5.7	Deployment 3
3.5.7.1	Installation
3.5.7.2	Test
3.5.7.3	Training
3.6	**SAFETYNET**
3.6.1	Product Mgmt
3.6.2	Subcontract & Procurement
3.6.3	Operations & Maintenance
3.6.4	Communications
3.6.5	Deployment 1
3.6.5.1	Installation
3.6.5.2	Test
3.6.5.3	Training
3.7	**Safety Build 1**
3.8	**Safety Build 2**
3.9	**Safety Build n**

Figure 5-7. Portion of Sample CVISN WBS in List Format to Level 5

As an illustration of including information attributes, Figure 5–8 is a portion of the sample WBS, this time with additional status columns.



Cost	Sched	Tech	WBS	Task	Schedule for Completion	Notes
G	Y	G	**3.0**	**Safety Project**		
			3.1	**Project Management**	ongoing	
			3.2	**System Engineering & Integration**		
			3.3	**Subcontract & Procurement Mgt**	ongoing	
G	**Y**	**G**	**3.4**	**CV Information Exchange Window (CVIEW)**		
G	G	G	3.4.1	Product Mgmt		
G	G	G	3.4.2	Subcontract & Procurement		
G	G	G	3.4.2.1	XYZ Subcontract Administration		
			3.4.3	Operations & Maintenance	2003	
G	G	G	3.4.4	Communications	Jan-01	Initial testing successful
G	Y	G	3.4.5	Version 1.0.x		
			3.4.5.1	Requirements	Sep-00	Complete
			3.4.5.2	Design	Dec-00	Complete
G	Y	G	3.4.5.3	Implementation	Apr-01	Down one staff member
G	Y	G	3.4.5.4	Version testing	Start May-01	Testing delayed - staffing
			3.4.5.5	Bug fixes	Complete Jul-01	
			3.4.5.6	Deployment		
			3.4.5.7	Training	Aug-01	

Figure 5-8. Portion of Sample CVISN WBS in Status Assessment Format

This table now has columns for cost / schedule / technical status, and comments. The System Architect and Project Leaders update it monthly and use it for status presentations. Only the rows (WBS items) in which there is or should be some current activity are marked with the Red / Yellow / Green status indicators. This example shows the power of the WBS as both a planning and status-tracking tool. The message here is that it's worth it to get the WBS right, because it can be used for many purposes.

5.3.3 How Do You Know if You Have a "Good" WBS?

The WBS forms the core of the planning process. Utilizing the WBS, tasks are assigned to individuals and organizations; costs are estimated; and schedules are set. Developing the WBS is usually iterative. The trick is to pick the right decomposition at the higher levels *so that rearrangement occurs within projects rather than across projects*.

Developing a "good" WBS is both an art and a science. Some tests for a good WBS are:

☑ Product-oriented hierarchy of goods and services.

☑ Basis for understanding and communication.

☑ Identifies and defines all effort to be expended.

☑ Basis for cost estimating, project organization, task scheduling, and status reporting.

☑ Assigns responsibility.

☑ Reflects the way the work is managed and performed.

☑ Based on system engineering.

☑ Each element is "manageable".

☑ Sufficiently low level to establish adequate visibility and confidence for cost estimating, project planning, and project control.

☑ Technical/cost/schedule can be integrated at every level for each element.

☑ Eliminating one product element will delete the associated costs.

☑ Segregates recurring from non-recurring costs.

☑ Top level reflects any WBS requirements imposed by sponsor.

It is cleanest if only one individual is responsible for each element in the WBS. It can be different individuals at different levels: typically higher-level managers at higher levels of the WBS. When element responsibility is shared, confusion often results.

The WBS can also be used to define the work to be done in each phase. Recall that a phase is a fixed period of calendar time (usually 3 to 6 months long) specified for planning purposes to allow incremental delivery of a complex system. Items at the lowest level of the WBS are allocated to different phases, with that group of WBS items constituting the detailed definition of each phase. Knowing that the work should be short enough to complete in a phase helps the Project Leader to decide how far to decompose the work.

5.4 Define the Program and Project Organization (Step 3)

5.4.1 Developing Organization Charts

Organization charts are intended to portray the downward flow of responsibility from the perspective of the CVISN program and projects, and may span state agency and contractor boundaries. The org chart at the **program level** has two views: entities and people. The entity-view shows the agencies and contractors supporting the program, from within their own hierarchical context. The people-view specifies the programmatic authority lines; such reporting lines may be temporary for only the duration of the program ("Matrix Management" as explained in Section 2.2), or they may mirror the state's permanent command and control hierarchy.

A sample entity-view org chart is shown in Figure 5–9. This chart depicts the permanent relationships among state agencies, with thicker borders used to highlight those agencies with major roles in the CVISN program.

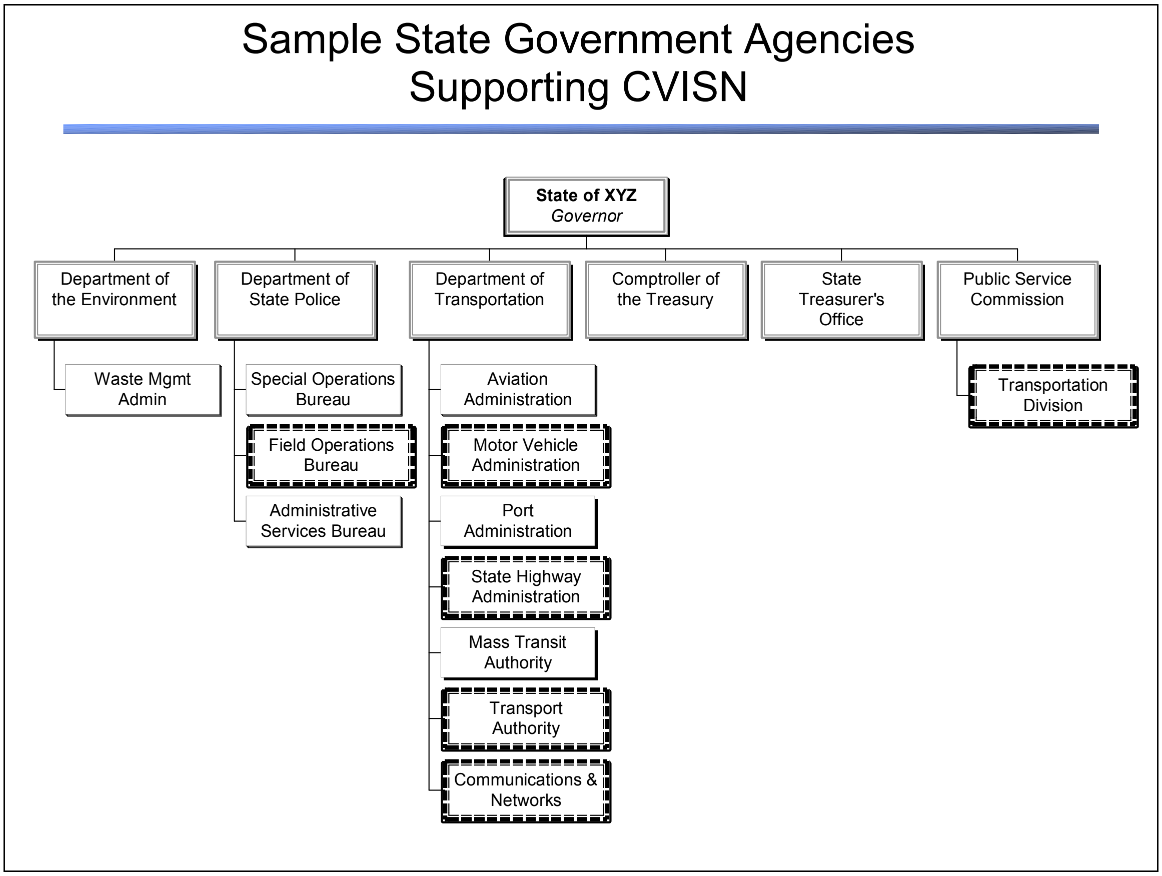

Sample State Government Agencies Supporting CVISN
State of XYZ
Governor
Department of the Environment
Department of State Police
Department of Transportation
Comptroller of the Treasury
State Treasurer's Office
Public Service Commission
Waste Mgmt Admin
Special Operations Bureau
Field Operations Bureau
Administrative Services Bureau
Aviation Administration
Motor Vehicle Administration
Port Administration
State Highway Administration
Mass Transit Authority
Transport Authority
Communications & Networks
Transportation Division

Figure 5-9. Sample State Government Organization Chart Highlighting Entities Supporting CVISN Program

Once the entity-view is established, you should develop a program-specific people-view org chart that identifies the Program Manager, System Architect, Project Leaders, state agency points-of-contact, members of the steering committee and the like. Figure 5–10 is an example. When there are many agencies supporting CVISN, formation of an Inter-Agency Coordinating Council is a way to knock down institutional barriers and foster teamwork at the highest levels. In Maryland, for example, the coordinating council is lead by an Assistant to the Secretary of Transportation, and meets as needed to address programmatic issues that cannot be resolved within an agency. Support from this group has been essential to making progress in Maryland.

Lastly at the **project level**, you'll need project-specific org charts showing who reports to whom – thereby defining the flow of authority and responsibility. Please see Figure 5–11 for an example of a project org chart. Be sure to include the key technical support and liaison positions. For example, if the project intends to install weigh-in-motion equipment at a roadside site, the "facilities" person (who must support the requirements definition, procurement, and installation of the equipment) should be shown on the project team.

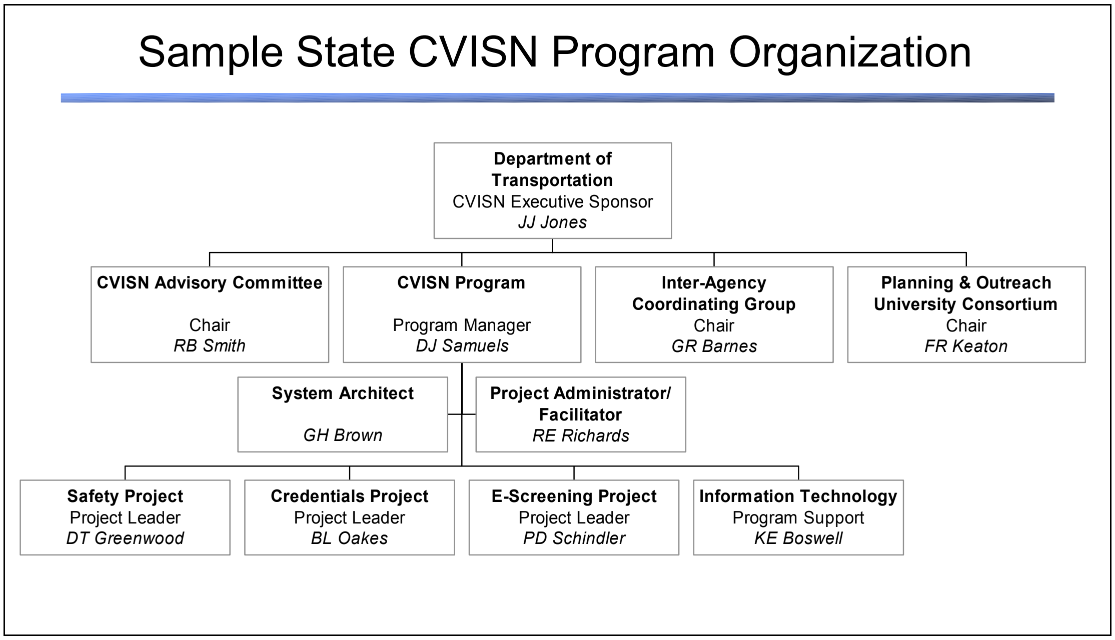
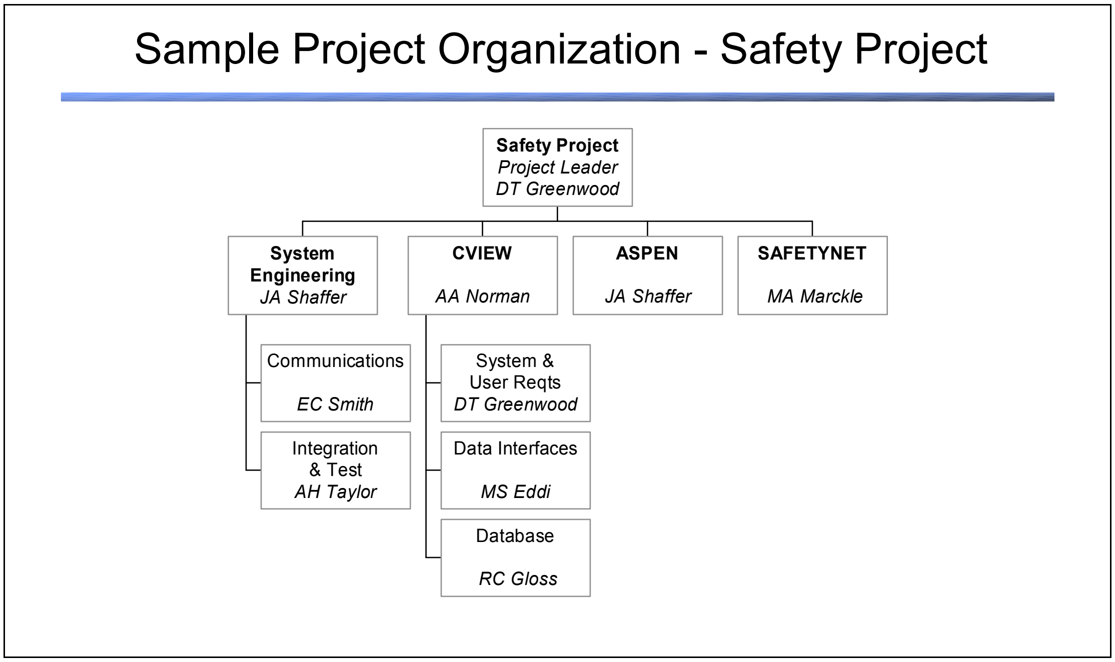

Sample State CVISN Program Organization
Department of Transportation CVISN Executive Sponsor JJ Jones
CVISN Advisory Committee Chair RB Smith
CVISN Program Program Manager DJ Samuels
Inter-Agency Coordinating Group Chair GR Barnes
Planning & Outreach University Consortium Chair FR Keaton
System Architect GH Brown
Project Administrator/ Facilitator RE Richards
Safety Project Project Leader DT Greenwood
Credentials Project Project Leader BL Oakes
E-Screening Project Project Leader PD Schindler
Information Technology Program Support KE Boswell

Figure 5-10. Sample CVISN Program Organization Chart Showing Programmatic Lines of Authority



Sample Project Organization - Safety Project

Safety Project
Project Leader
DT Greenwood

System Engineering
JA Shaffer

Communications
EC Smith

Integration & Test
AH Taylor

CVIEW
AA Norman

System & User Reqts
DT Greenwood

Data Interfaces
MS Eddi

Database
RC Gloss

ASPEN
JA Shaffer

SAFETYNET
MA Marckle

Figure 5-11. Sample Project Organization Chart

Try to avoid fragmented assignments; that is, tasking people with part-time assignments for long periods. You are better off with one person working full-time than four people working quarter-time because of people's shifting priorities and the inherent inefficiency of shuffling back and forth from one task to another.

Having each team draw up a "team charter" is one way to impart additional meaning to the teams [3]. When members put into words the team's purpose and goals, and their own individual roles and responsibilities, they get their project started on firmer footing.

5.4.2 Name Lead Individuals Whenever Possible

As soon as possible name lead individuals and define responsibilities for assignments such as.

- Program Manager
- System Architect
- Project Leaders
- Facilitator/Administrator
- Financial Manager
- Procurement and Contracting Representative
- Network & Infrastructure Representative
- Enforcement Community Representative
- Credentials Community Representative

Appendix D provides sample descriptions for some of the key positions. The Project Leaders should appear on the program organization chart. The Task Leaders should appear on the project organization charts.

In most cases the CVISN Program Manager is not free to assign individuals unilaterally. Those individuals' functional supervisors will assign or approve them. For example, the agency Information Technology Manager will assign the staff member to be the point-of-contact for network issues.

Ramping up team staffing takes a great deal of calendar time, normally months. Start early.

The preceding was looking “below the program”. Also look “above the program”. Ask the Director of the Department of Transportation to formally appoint an Executive Sponsor. This person will function as a champion in the innermost circles of power. He or she needs to be a believer in CVISN.

Identify roles and individuals on the Inter-Agency Coordinating Council. These will typically be agency heads. There will be occasions when decisions need to be made that cross major jurisdictional areas and this is the venue.

Recruit carriers and individuals for the Carrier Advisory Council and consult with them on key decisions and to help set priorities. Identify trial participating carriers and their points-of-contact.

5.4.3 When Lead Individuals Cannot Be Named Yet

At least show the slot and identify TBD (to be determined) as the person responsible for filling it. Be sure you revisit the organization charts during the planning for each phase to remind yourself of any empty slots that need to be filled.

5.4.4 Harness Team Power

You will happily discover that a cohesive team is far more than the mere sum of its members. Interactions build upon themselves with multiplicative power. You can harness this by seeking input, collaboration, and review on what might otherwise be a single-person activity such as writing detailed plans. For example, harness team power on a document by:

- Starting the task well in advance of the deadline, for example 2 months.
- Circulate an outline for review and comment.
- Review a crude draft with a close colleague.
- Circulate a preliminary copy for review and comment.
- Finally conduct a page-by-page walkthrough.

Develop and post working-level schedules. Peer pressure can be harnessed as the hidden hand of management.

5.4.5 Provide Staff Training

FMCSA has supported the development of four courses:

- "Introduction to ITS/CVO" [15]
- "ITS/CVO Technical Project Management for Non-Technical Managers" [16]
- "Understanding ITS/CVO Technology Applications" [17]
- "CVISN and Safety Planning Processes" [79]

Folks on your team may have already attended these courses. Consider sending new team members to future training opportunities, or at least lend them a copy of the course material.

Professional organizations such as the Project Management Institute [2], and commercial training vendors, also provide very practical project management training. Training on specific technologies is available from local colleges or from commercial training vendors.

New staff will benefit from reading the *Introductory Guide to CVISN* and the other CVISN Guides. Please consult the reference list in Appendix A.

5.5 Define the Processes (Step 4)

Your **program** should have defined processes for the activities you want to be common across all projects. When state agencies and contractors use common processes for common activities, it helps ensure effective and clear coordination and communication. For instance, you may choose to make these processes common across the program:

- Project planning. This chapter describes the program and project planning processes, and can be used as a reference. The *COACH Part 2, Management Checklists* [70] is a way to measure your commitment to the principles and processes described in this document.
- Procurement. Chapter 6 describes the funding and contracts processes, which includes procurement.
- Phase planning and tracking. Described in the *CVISN Guide to Phase Planning and Tracking* [44].

If you want to make such processes common in your state, you already have process descriptions that you can reference. Start with what is in this guide, the COACH Part 2, or the CVISN Guide to Phase Planning and Tracking; then tailor it to your specific needs.

Even though you may not choose to make all system development processes common, recall that one of the key concepts for CVISN program planning is that a complete system design ensures that the system as a whole is considered when implementing CVISN pieces. The *CVISN Guide to Top-Level Design* [62] describes the top-level design process. The *CVISN Guide to Phase Planning and Tracking* [44] describes the activities that occur in each subsequent development phase.

You probably already have configuration management processes in place in your organization. Use them. If you need to re-evaluate your existing configuration management processes, consider the IEEE standard on the subject [68].

The references listed above provide a solid starting point for process definitions. When you need to, tailor the processes to fit your program. Document the differences between the references and your own processes in a chapter of the program plan, and make sure the project teams are aware of their responsibilities to follow the processes. Not all processes need to be common across projects; pick the processes that support key project information exchanges and make them as simple and useful as possible.

Processes unique to program-level activities should also be documented in the program plan. Be clear about which processes apply to all projects, and which apply only to the program-level efforts.

Even for common processes, sometimes one project has a good reason to do things a little differently. The project can tailor the standard program process by describing what they want to do differently (in their project plan), and getting approval for the tailored process. Projects may also need to define processes not addressed by the program plan. For instance, a project may use a particular tool to assist in the design and code-management processes.

Encourage cross-project communications and lessons-learned about processes. If one project meets with success using their processes, make sure the other Project Leaders hear about it. Consider promoting successful project-level processes program-wide.

5.6 Assign the Work to Organizations (Entities) and People (Step 5)

5.6.1 Assign Responsibility to Entities and Execution to Individuals

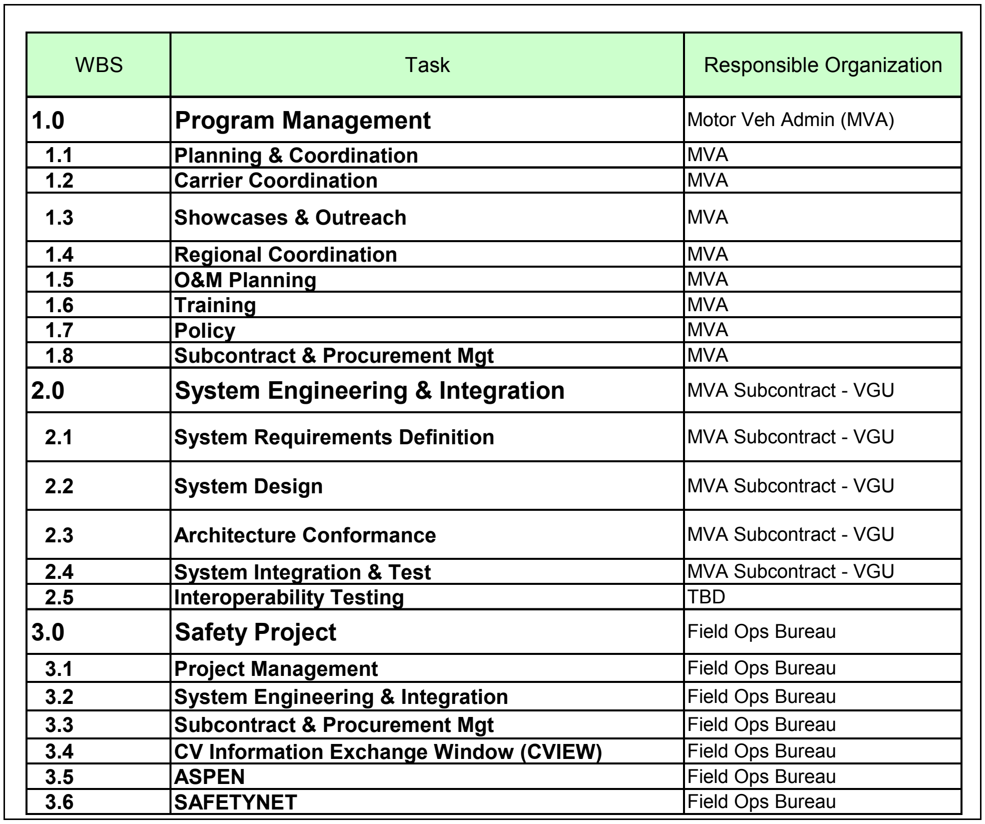
Project management textbooks call this “mapping the WBS to the org chart”. It also ought to symbolize accountability since the acceptance of an assignment should include caring about its success or failure. Accountability is assigned to entities because those are permanent when compared to the coming and going of individual staff members.

Eventually real work gets done when actual individuals get assigned self-referencing tasks. “Self-referencing” means everything that needs to be known is either already known (by training or experience) or can be readily derived (from documentation and through analysis). Everything up to that point has been planning.

The Program Manager will first **assign responsibility** for each one of the elements captured in the Work Breakdown Structure to an organizational unit such as a state agency or contractor. Next the Project Leader or Task Leader at each agency or company will **assign execution** of each task to a specific individual. This could be portrayed in the form of a task table identifying the lead organization and person for each task.

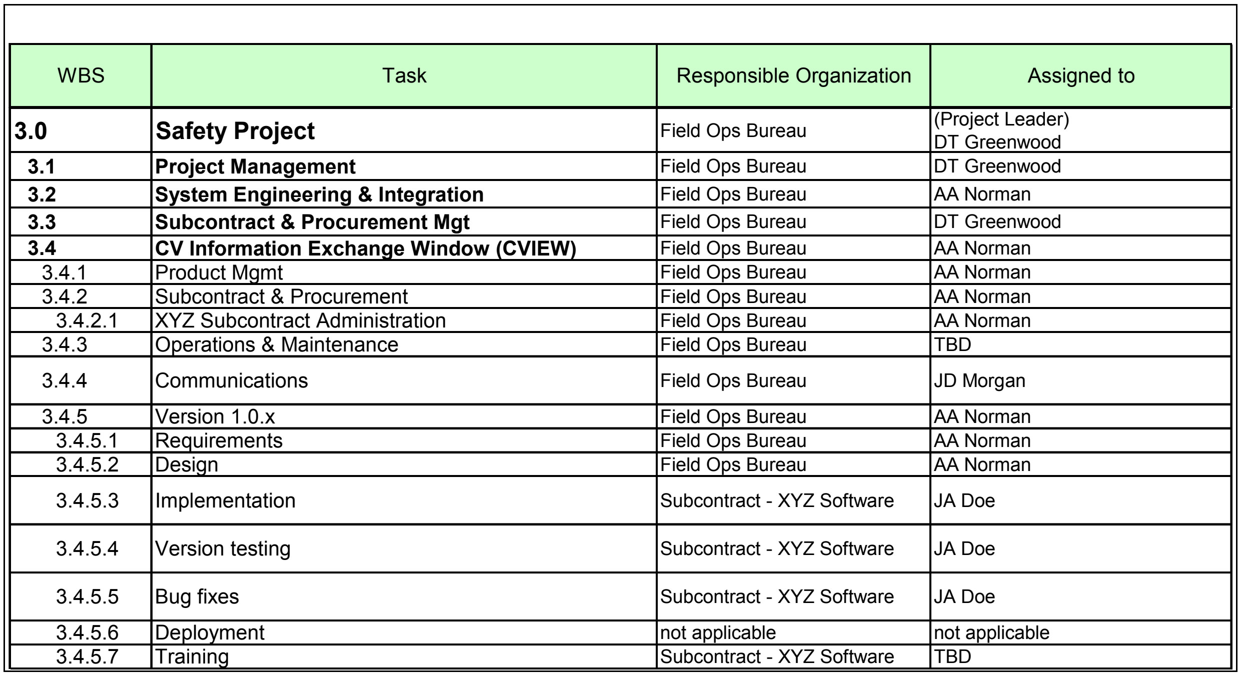
Figure 5–12 shows a portion of the high-level WBS mapped to organizations (or contractors). The Program Manager works with the Project Leaders to make this mapping.

Figure 5–13 shows a portion of the more detailed WBS mapped to organizations and individuals. The Project Leader works with his/her team to make this mapping.



WBS	Task	Responsible Organization
1.0	**Program Management**	Motor Veh Admin (MVA)
1.1	**Planning & Coordination**	MVA
1.2	**Carrier Coordination**	MVA
1.3	**Showcases & Outreach**	MVA
1.4	**Regional Coordination**	MVA
1.5	**O&M Planning**	MVA
1.6	**Training**	MVA
1.7	**Policy**	MVA
1.8	**Subcontract & Procurement Mgt**	MVA
2.0	**System Engineering & Integration**	MVA Subcontract - VGU
2.1	**System Requirements Definition**	MVA Subcontract - VGU
2.2	**System Design**	MVA Subcontract - VGU
2.3	**Architecture Conformance**	MVA Subcontract - VGU
2.4	**System Integration & Test**	MVA Subcontract - VGU
2.5	**Interoperability Testing**	TBD
3.0	**Safety Project**	Field Ops Bureau
3.1	**Project Management**	Field Ops Bureau
3.2	**System Engineering & Integration**	Field Ops Bureau
3.3	**Subcontract & Procurement Mgt**	Field Ops Bureau
3.4	**CV Information Exchange Window (CVIEW)**	Field Ops Bureau
3.5	**ASPEN**	Field Ops Bureau
3.6	**SAFETYNET**	Field Ops Bureau

Figure 5-12. Sample Program Work Assignments



WBS	Task	Responsible Organization	Assigned to
3.0	**Safety Project**	Field Ops Bureau	(Project Leader) DT Greenwood
3.1	**Project Management**	Field Ops Bureau	DT Greenwood
3.2	**System Engineering & Integration**	Field Ops Bureau	AA Norman
3.3	**Subcontract & Procurement Mgt**	Field Ops Bureau	DT Greenwood
3.4	**CV Information Exchange Window (CVIEW)**	Field Ops Bureau	AA Norman
3.4.1	Product Mgmt	Field Ops Bureau	AA Norman
3.4.2	Subcontract & Procurement	Field Ops Bureau	AA Norman
3.4.2.1	XYZ Subcontract Administration	Field Ops Bureau	AA Norman
3.4.3	Operations & Maintenance	Field Ops Bureau	TBD
3.4.4	Communications	Field Ops Bureau	JD Morgan
3.4.5	Version 1.0.x	Field Ops Bureau	AA Norman
3.4.5.1	Requirements	Field Ops Bureau	AA Norman
3.4.5.2	Design	Field Ops Bureau	AA Norman
3.4.5.3	Implementation	Subcontract - XYZ Software	JA Doe
3.4.5.4	Version testing	Subcontract - XYZ Software	JA Doe
3.4.5.5	Bug fixes	Subcontract - XYZ Software	JA Doe
3.4.5.6	Deployment	not applicable	not applicable
3.4.5.7	Training	Subcontract - XYZ Software	TBD

Figure 5-13. Sample Project Work Assignments

As always when assignments are made, the line organization must support the tasking. If a line supervisor not directly involved in your project objects to their staff working on your project, that staff member probably won't meet your project's schedules. Be sure to confirm and reconfirm commitment from line management.

The sample project work assignments shown above is a fragment of the master WBS for the program. Not shown are other rows that correspond to other projects or program-wide tasks. Also not shown are columns that support the process of developing a procurement strategy. Those additional columns are shown in the next section.

5.6.2 Build or Buy?

Part of assigning work is making decisions about alternative approaches to obtaining products. The "Build or Buy" decision-making process involves deciding what tasks or products will be performed or developed by state staff, and what tasks or products will be procured.

As those decisions are made you should capture them as part of the procurement strategy in your program plan. You will assign procurement activities to different organizations based on such factors as what must be procured, what stakeholders should be involved in the procurement, what items might be grouped together in a single procurement, and what procurement processes and regulations must be followed.

5.6.3 Procurement Strategy

You may recall a discussion from the “Understanding ITS/CVO Technology Applications” training course [17] about making decisions regarding building or buying information system components. That material is repeated here as food for thought.

While you debate your options for implementing functionality, consider these alternatives:

- Build from scratch (either using your own staff or paying a contractor).
- Assemble commercial off-the-shelf (COTS) components and add custom software components.
- Modify an existing package.
- Buy a complete COTS software package and configure it.

You should define criteria and analyze each option in making your “Build vs. Buy” decision for each system. You might conduct a trade-off study to decide what approach to take. Figure 5–14 shows some rules of thumb.

Approach	Cost	Schedule	Risk	Quality	Maintainability	Other
Build	Highest	Longest	Often high risk of not producing a useful product	Unknown. Depends on process & team	Highest. Must have in-house maintenance staff	Staff availability?
Assemble	High	Long	Risk that pieces may not fit together	Partially unknown	High	System integration experience?
Modify	Lower	Moderate	Known	Known. Probably similar to existing system	Lower	Quality of legacy system?
COTS	Lowest	Shortest	May not be able to meet all critical requirements	Need to make compromises to preferred business processes	Lowest. Vendor spreads costs over many customers	Available choice of packages?

Figure 5-14. Build versus Buy Decision Table for Information Systems

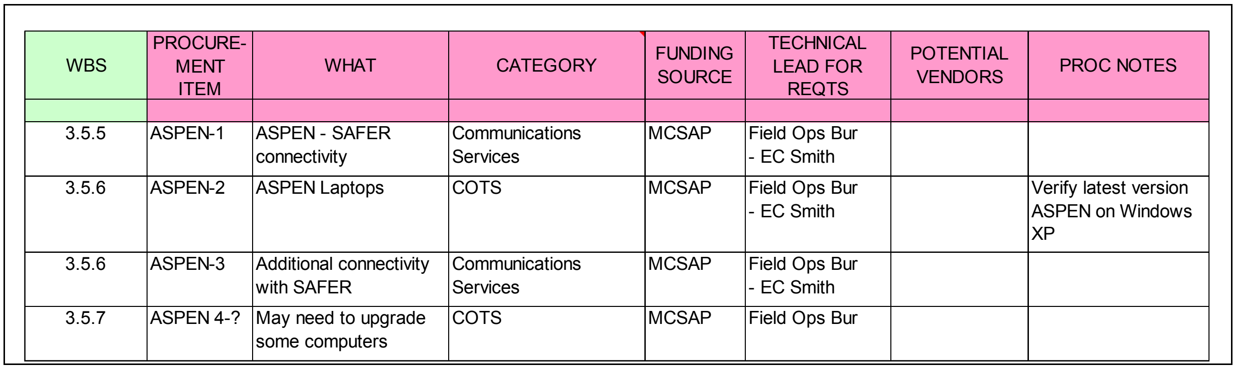
You need to select an approach that is best for you considering local circumstances. You may also decide to subcontract for technical services such as a system architect, system integrator, or software developer.

The build versus buy, and own-staff versus subcontractor decisions must be made early, since they influence the work breakdown structure, schedules, and costs.

As you identify what you need to buy, characterize the items so you can develop an overall strategy for procurement. **To characterize the "buy" items, make note of:**

- What you need to buy.
- Category (for example: infrastructure design, infrastructure construction, commercial off-the-shelf, software development, systems integration, personal services/consulting, communications services).
- Funding source, if known; it may have restrictions.
- Lead technical organization/person for requirements.
- Potential vendors, if known.

Figure 5–15 shows a supplementary table to the WBS, which adds the procurement characterization columns to those WBS elements having one or more procurement items.



WBS	PROCURE-MENT ITEM	WHAT	CATEGORY	FUNDING SOURCE	TECHNICAL LEAD FOR REQTS	POTENTIAL VENDORS	PROC NOTES
3.5.5	ASPEN-1	ASPEN - SAFER connectivity	Communications Services	MCSAP	Field Ops Bur - EC Smith		
3.5.6	ASPEN-2	ASPEN Laptops	COTS	MCSAP	Field Ops Bur - EC Smith		Verify latest version ASPEN on Windows XP
3.5.6	ASPEN-3	Additional connectivity with SAFER	Communications Services	MCSAP	Field Ops Bur - EC Smith		
3.5.7	ASPEN 4-?	May need to upgrade some computers	COTS	MCSAP	Field Ops Bur		

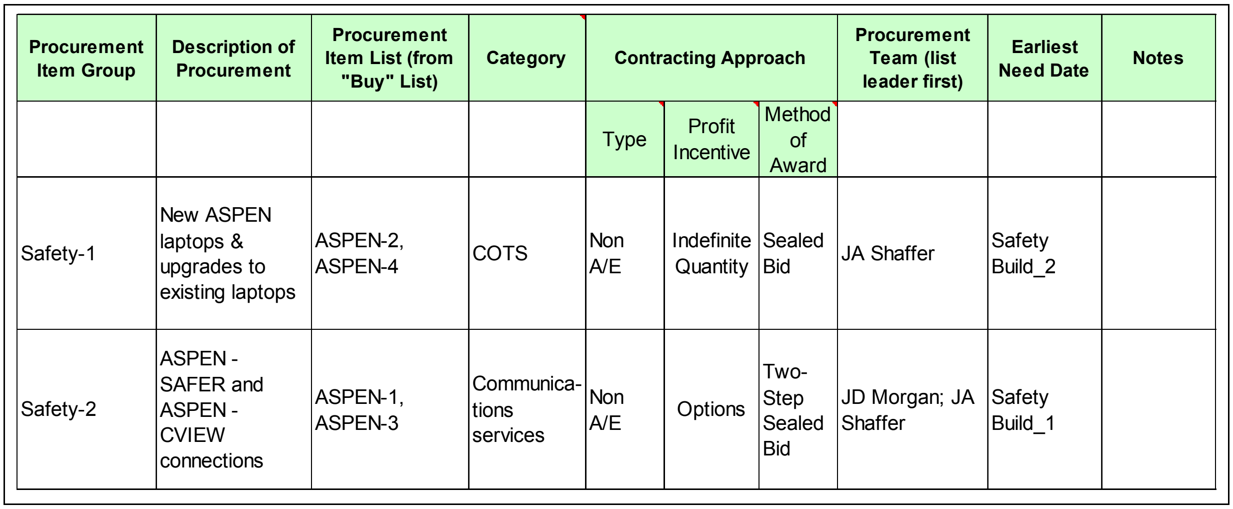
Figure 5-15. "Buy" List Based on WBS

Once you have a fairly good idea of what you need to procure, you can develop a strategy for how you are going to accomplish the procurements. This strategy will serve as a procurement roadmap. Your goal in developing the strategy is to make the procurement process as flexible, simple, and timely as you can. See which items you can bundle together in one procurement. Determine what kind of contracting approach best fits each procurement. See if you have adequate staff to accomplish the procurements. **Your procurement strategy should consider:**

- What items are being bundled into each procurement.
- Who will accomplish each procurement. Often you'll need to assign a team. For instance, the team might consist of someone who knows the procurement process, technical folks who can specify requirements, and an administrator to track status. If the items to be purchased are being funded by different agencies, authorization to make purchases may have to be granted to someone outside several of those agencies.
- The contracting approach for each procurement.
- Type (for example: architecture/engineering design, construction, non architecture/engineering and services, innovative contracting).

- Options (for example: design-bid-build, design-build, systems integrator, public-private partnership).
- Methods of award (for example: sealed bids, two-step sealed bids, competitive negotiations, sole source contracting, unsolicited proposals).
- Pricing methodologies (for example: cost reimbursable, competitive fixed price, published price, unit pricing).

Figure 5–16 illustrates a worksheet for defining your procurement strategy. After the worksheet has been completed, you should update the WBS to show the procurement tasks as work items assigned to an organization and individual.



Procurement Item Group	Description of Procurement	Procurement Item List (from "Buy" List)	Category	Contracting Approach			Procurement Team (list leader first)	Earliest Need Date	Notes
				Type	Profit Incentive	Method of Award			
Safety-1	New ASPEN laptops & upgrades to existing laptops	ASPEN-2, ASPEN-4	COTS	Non A/E	Indefinite Quantity	Sealed Bid	JA Shaffer	Safety Build_2	
Safety-2	ASPEN - SAFER and ASPEN - CVIEW connections	ASPEN-1, ASPEN-3	Communica-tions services	Non A/E	Options	Two-Step Sealed Bid	JD Morgan; JA Shaffer	Safety Build_1	

Figure 5-16. Procurement Strategy Worksheet

Looking at all the forecasted procurements up-front makes it possible for you to establish a plan of attack that will benefit the program. Please see Appendix E and the many documents it references for more information about procurement strategies.

5.7 Define Milestones and Schedules (Step 6)

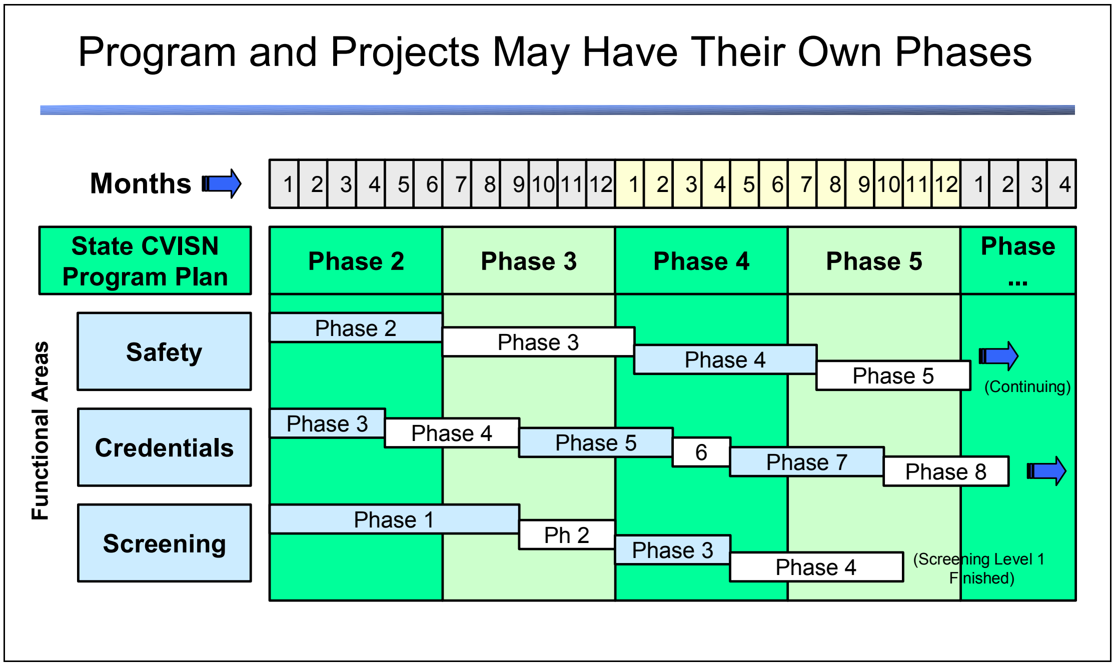
5.7.1 Begin with High-Level Objectives

In **program** planning, at this step you define the integrated capabilities you intend to demonstrate in development and deployment phases, and identify critical milestones that will help you measure progress towards completing those phased program objectives.

You will be segmenting your program into development and deployment phases of, say, 3-6 months duration. Program phases of that length are recommended because it is difficult to accomplish anything in less than three months, and for a phase longer than 6 months resource availability is difficult to forecast. Breaking the objectives down into smaller steps means that you are able to show progress at the end of every phase. Everyone – from upper management to the real workers – can see and feel good about what has been accomplished in a 3-6 month program phase.

Working with the System Architect, the Program Manager and Project Leaders set high-level objectives for each program phase by defining the program-wide capabilities that are to be achieved. The notion is that each program phase builds upon the previous phase to achieve all of the program's objectives by the end of the last program phase. The build-up of partial capabilities in program phases allows customer feedback before the capability is completed and provides visibility into progress. There is an example of objectives for a program phase in Chapter 4, Figure 4–6.

In the "Define Milestones and Schedules" step at the **project** level, you want to define project-specific objectives for each build, slightly more detailed schedules for accomplishing those objectives, and milestones to measure the project's progress. The timing of one project's phases need not line up with another project's phases or with the program's phases. That may occur because the project may not be able to finish all the work that makes sense to group together in its build in the same time window allotted at the program phase level. Or, the project may be able to finish two builds during a single program phase (and, hence, the project may get through two phases within a single program phase). Figure 5–17 illustrates how program and project phases may be related.

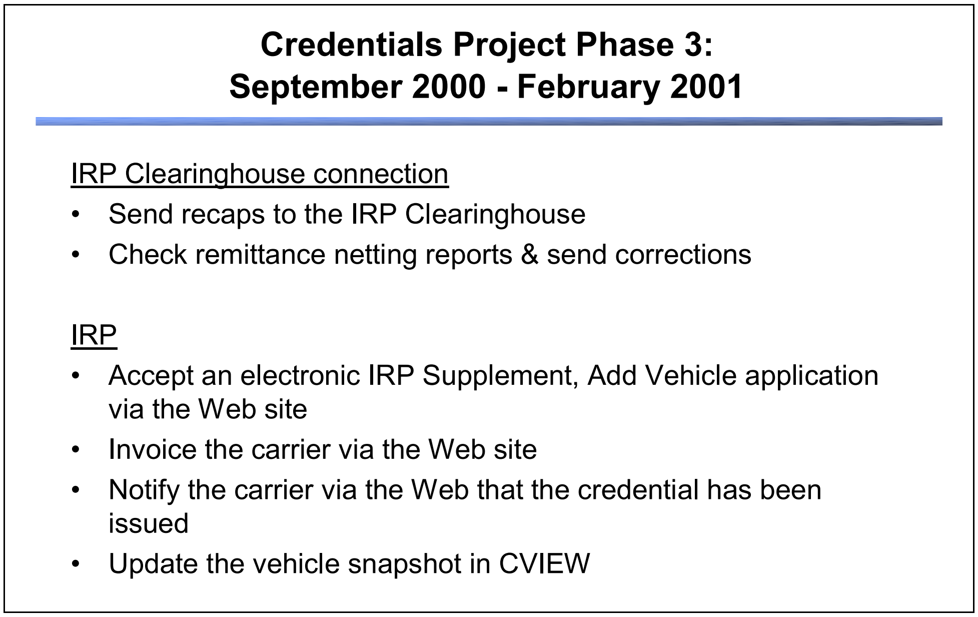


Program and Projects May Have Their Own Phases

Figure 5-17. Phases are Defined for the Program and its Projects

The process of defining a more detailed schedule for a project phase occurs close in time to the phase itself, and is described in the *CVISN Guide to Phase Planning and Tracking* [44].

Phase objectives can be shown in the same format (a bulleted list) for a project's phase as they are shown for the program. Figure 5–18 is an example.



Credentials Project Phase 3:
September 2000 - February 2001

IRP Clearinghouse connection

- Send recaps to the IRP Clearinghouse
- Check remittance netting reports & send corrections

IRP

- Accept an electronic IRP Supplement, Add Vehicle application via the Web site
- Invoice the carrier via the Web site
- Notify the carrier via the Web that the credential has been issued
- Update the vehicle snapshot in CVIEW

Figure 5-18. Sample Objectives for a Project Phase

The program-level objective for a particular phase might be to demonstrate end-to-end processing of International Registration Plan (IRP) credentials. By that, the program means that a carrier will be able to submit some IRP application electronically, the IRP system will handle it electronically and send an electronic response, and the roadside will know about the credentialing action. For the credentials **project**, the detailed objectives might be as shown above. The credentials project's objectives are more specific than the program's objectives. They limit the "end-to-end processing" to one kind of IRP transaction, and clarify what processing must be electronic. These objectives do not preclude utilizing Electronic Funds Transfer (EFT), nor do they preclude an immediate update from the IRP system to CVIEW. On the other hand, they do not require EFT processing, and they allow for some manual intervention to accomplish the snapshot update in CVIEW such as temporarily re-keying some data elements.

5.7.2 Bottom-Up Sanity Check

Once you have identified the capabilities you'd *like* to achieve in each program phase, it's wise to do a sanity check. An effective approach is to ask each Project Leader to identify the tasks from his/her project that are associated with achieving each set of the program's phase objectives. During this exercise they may realize that you're hoping for too much in too short a period of time, and ask that the program phase objectives be made more realistic (i.e., de-scope the phase), or ask that the time allotted to the program phase be extended. This is almost always sound advice; listen to what they say – they know the details about what needs to be done to meet the objectives. On the other hand you need to keep an eye on the end target for the program; if you adjust the objectives downward for every program phase you may not be able to achieve the end results everyone agreed to. Either the over-all objectives for the program were too ambitious in the first place, or the planning for each phase is too conservative. Sometimes you have to aim high, hope for some good luck, and push progress forward. Other times you have to realize you're asking too much. As a Program Manager it's your job to work with the System Architect and Project Leaders to figure out what can be achieved on a realistic schedule. You want everyone on the team to feel confident, proud, and appreciated. You want every part of the team to accomplish as much as they can. Expect to iterate the process of setting objectives and dates for each program phase.

5.7.3 Establish Milestones

You don't want to wait until the end of a program phase to realize that it's in trouble. Defining major milestones for each program phase helps you keep a handle on progress during the phase**.** **A milestone consists of three components: a measurable event, a planned date, and an actual date**. External dependency milestones can be used to mark when the program needs something that is not under its control to happen. For example you may be planning to use next-generation ASPEN and want to schedule computer upgrades and CVIEW development activities to coincide with its delivery. But you cannot control when next-generation ASPEN will actually be made available. In your phase planning, you make an assumption about when you will be able to use ASPEN (based on what its developers tell you), and use that assumption to plan related activities. Dependencies like this, especially ones that are external to the program, need to be identified, assumptions about them made clear, and impacts made visible.

Other key events are also good candidates for program-level milestones. Some examples of critical milestones are: the delivery of a product requirements or design document; demonstration of initial interface capability via testing; or the completion of the first of a series of training classes. Taking credit for having reached a milestone should be completely objective. A milestone that is poorly defined will have less significance than one that is clear and unambiguous to everyone.

Project milestones for a project phase should be used to indicate dependencies across projects, dependencies that are external to the program, and project-internal accomplishments necessary to achieve the project phase's objectives. It is handy to have at least one milestone each month. During initial project planning, it may not be possible to define that many milestones. The definition of most milestones is deferred until planning for each project phase. However, some milestones are obvious even during the initial project planning: completion of testing, having a contract in place for needed facilities or software support, or legislative approval for some proposed addition to a standard form.

Procurement schedules must be tied to the tasks and functions the procurements will support. Lead times for procurement should be accounted for in setting the schedules.

5.8 Estimate Costs and Resources (Step 7)

5.8.1 Top-Down Cost Estimates

At the **program level** cost estimates are used to secure funding and to allocate received funding to projects. At the **project level**, detailed cost estimates are used to supply information to the program, and to identify staffing or procurement needs.

Cost estimates included in the **program** plan are usually developed "top-down" based on rough ideas of the effort and procurement required to accomplish the objectives. These resource estimates are needed for each element in the WBS at level 3. In addition, each estimate ought to include a written rationale called the *basis of estimate*. The basis of estimate indicates whether the estimate is inferred from past experience, analogy, expert judgment, or built up from further breakdown of the element. Later, actual costs and personnel utilization can be accumulated at the end of a phase and compared to the original estimates. Estimates for the remaining phases are adjusted accordingly.

The steps in developing a program-level cost estimate are:

- Estimate the effort and procurements associated with each project.
- Estimate the effort and procurements associated with program-level support items.
- Call the above "base" costs. Add 15% of labor base for system integration.
- Add 10% of labor base for program management.
- Add and hold aside 10% of labor base and procurement costs for management reserve.
- Allocate costs to fiscal years.
- In each fiscal year, allocate the costs to the program-level WBS items and to the projects identified in the WBS.

Unless required to do otherwise, for simplicity and convenience the Program Manager may choose to leave state employee labor estimates in units of manpower rather than convert them into dollars. The informal distinction is made between the "soft dollars" of salaries that would have been paid anyway, versus the "hard dollars" of procurement costs that represent additional outflow from the state treasury.

The Program Manager, Administrator/Facilitator, System Architect, and Project Leaders usually work together to develop the cost estimate for the program.

5.8.2 Bottom-Up Cost Estimates

Cost estimates included in the **project** plan are usually developed "bottom-up" from lower levels of detail that have been "rolled up" to the appropriate WBS level. The steps in developing a project-level cost estimate:

- Estimate the labor required to implement each WBS element
  - break the labor into internal and external labor
  - option: break internal estimate into estimates by agency
- Estimate the dollars needed to implement each WBS element
  - purchase costs
  - services costs
  - external labor costs
  - travel expenses
- Provide a basis for the estimated costs
  - vendor quote
  - previous experience
- Then roll up the costs to estimate costs at the project-level WBS element

The detailed schedule information supports the cost estimates, and vice versa. The combination of the schedule and estimated effort are used to define staffing requirements and to make assignments. Staff availability and the salaries of the assigned team members affect costs.

The costs associated with the procurement of specific hardware, networking services, and commercial software products are usually best estimated at the project level. The project team members know what is needed, and often have the contacts to estimate costs quickly and accurately enough.

As each phase is begun it is a good idea to revisit that phase's budget estimates and make sure there are no surprises or new costs that are not accounted for in the project's funding allocation for the phase.

5.8.3 Funding Allocation

The next step is to match known funding sources to the estimated program needs. Be sure the program team understands any spending guidelines and restrictions that apply to the moneys allotted to the program.

Follow those guidelines as you allocate program funds across projects and across phases. As available funds are allocated, look for strategies to mitigate risks associated with potential future funding problems, uncertainties associated with the technologies, and other "known unknowns". For instance, be sure you get something finished with the initial funding increment, rather than getting lots of things started but nothing finished. The phased development strategy is specifically geared towards this goal.

Prepare charts that graphically illustrate the funding allocation to answer two different questions:

- Where is the money coming from?
- To what projects is the money allocated?

It is often the case that you don't have all the funding sources identified at this stage of the program. That's okay. You can use the plan you're developing to help secure new funding. Please see the next chapter! If that new funding doesn't materialize over time, you'll have to revisit the planning process and de-scope the program objectives.

5.9 Maintaining the Plans

5.9.1 Iteration All Over Again

At the start of this chapter we noted that the planning processes are iterative. It's worth saying it again. The planning processes, especially those related to defining the work (developing the WBS), defining the organization, assigning work to organizations, developing a procurement strategy, setting milestones and schedules, and estimating costs must be revisited again and again as you learn more from subsequent steps that affect earlier ones. For instance, you may draw up an organization chart based on projects and program-wide support functions and think that step is finished. But as you work on your procurement strategy, you may realize that it makes sense to group several procurement items under one procurement, and that you need a new organizational entity to coordinate the procurement. Be willing to revisit earlier steps in the planning process as you work through the later steps.

At a minimum review, refresh, and update all plans at least once a year, typically to coincide with the annual budget cycle. It is preferable to update plans sooner, at the end of every phase. But you can hold off formally publishing the documents – see the next section.

5.9.2 Publicizing Plans

After the program and project plans are written, there is a tendency to put them on the shelf and forget about them. It seems to be a universal experience that as soon as you finish a plan, it's out of date!

But if you've followed the advice in this guide, you've constructed your plans to be useful not only for planning, but also for tracking progress. You'll be motivated to maintain the parts that are most useful to you. Here is some general advice:

- It is not necessary to republish an updated plan on any fixed schedule. Rather, republish when the previously-published document is hopelessly out of date, and when external forces and circumstances require you to do so. For instance, a typical external circumstance for republishing a program plan is the approaching end of a funding cycle.
- Integrate the planning and status-reporting processes. Use the plan for tracking status at a comfortable level of detail. Use it as the basis for reporting status to management. (Considerably more is said about this in the *CVISN Guide to Phase Planning & Tracking* [44].)
- Make it a point to keep up-to-date the parts that you use over and over. Derive formal reports (for example, monthly or quarterly status report) from the plan. If you can't currently use the plan directly for reporting, consider revising the plan contents/format so that you can.
- Keep an electronic copy of the all the plans on a program-wide server so that team members can view them and can update the details.

- The Program Manager should keep a working copy of the Program Plan. Redline it. Add to it. Build the program history as you go.
- The Project Leader should keep a working copy of the Project Plan. Redline it. Add to it.
- Reconfirm commitment to the program and its projects as often as needed to maintain forward momentum.
- Archive the project history as you go, especially any reasons for changes in scope and schedule. Should the worst happen, be prepared to defend your side of it in a formal dispute.
- Keep track of issues somewhere, somehow. It's important to avoid re-opening issues on which you reached solid consensus. It's also important not to lose an issue that you aren't ready to face now, but must face later.

Don't get bogged down with unnecessary document maintenance. You wrote them to help you manage the program and projects. See the *CVISN Guide to Phase Planning & Tracking* [44] for suggestions about balancing the need for written plans versus the need to get the job done.